

## FORECASTS AND WARNINGS.

By Prof. A. J. HENRY, temporarily in charge of Forecast Division.

Stormy weather prevailed over the north Atlantic during the greater part of November, the periods of severe weather being from the 4th to 9th and 18th to 25th and again on the 30th. For the greater portion of this time gales were particularly severe along the coasts of the Canadian Maritime Provinces as well as on the British coast. The storm which past off the Newfoundland coast on the 18th was experienced on the 21st at the Azores, where it raged continuously for two days. It appears not to have reached European shores. At the close of the month a severe storm was passing eastward over the western Atlantic, pressure being below 29.00 inches at St. Johns, N. F. The period November 15-25 was productive of continuous gales and stormy weather, especially over the track of vessels between the Mediterranean and New York.

In the first decade of the month no storm of importance traversed the United States east of the Rocky Mountains; in the North Pacific coast States, however, the weather was very stormy, with almost incessant rains. The rivers and small streams in Washington west of the Cascade Range overflowed their banks between the 9th and 15th and caused an immense amount of damage. The greatest loss was sustained in the district between Puget Sound and the Columbia River. In this region the rivers became raging torrents, overflowed their banks, and converted the lowlands into inland seas. The total loss as estimated by newspapers was over \$2,000,000.

In the second decade of the month a storm of more than ordinary severity in some portions of its path crossed the United States. It reached the north Pacific coast on the evening of the 14th; it was attended by high southerly gales and heavy rains in Oregon and Washington, which continued uninterruptedly for about twenty-four hours. Two days after striking the coast the storm formed an irregular shaped depression extending from North Dakota southeastward to Iowa and thence southwestward to western Arkansas. This depression was separated into two portions during the next twelve hours, the northern portion remaining almost stationary in North Dakota for thirty-six hours and then moving northeastward as a storm of little strength. The southern portion of the original depression was evidently forced to southern Texas by a strong rise in pressure over the eastern Rocky Mountain slope. It occupied southern Texas from the morning of the 17th until the night of the 19th and then moved northeastward, developing great strength over the upper Lakes on the night of the 21st. While this storm occupied southern Texas it seemed to be continually fed by secondary developments over Arizona and New Mexico which moved southeastward and merged in the general area of low pressure over Texas. As the area of high pressure advanced in the rear of these secondary developments extremely cold weather for the season was experienced in New Mexico and western Texas, and snow fell for more than twenty-four hours. The snow was attended by strong winds and very low temperatures. Five persons are known to have perished from exposure to the storm and the loss of live stock, especially sheep and goats, was considerable.

The last decade of the month was characterized by high pressure over the north Pacific coast and thence southeastward into the middle Mississippi Valley, thru which several lows that developed in the extreme Southwest seemed unable to pass.

## BOSTON FORECAST DISTRICT.

The month, as a whole, was quite pleasant, altho there was much cloudy, unsettled weather. While precipitation occurred on an average of nine days, the monthly average, 2.58 inches, was 1.58 inches below the normal. The first half of the month was cooler than the average, and the latter half generally warmer than usual. The result was a mean temperature of

37.3°, which is 0.6° below the normal. The only severe storm during the month was that of the 15-16th. It moved northward along the coast causing general heavy precipitation, rain in southeastern sections and snow elsewhere, with strong easterly gales of almost hurricane force on the coast and over the ocean. All shipping was delayed from twenty-four to thirty-six hours by the storm, several small vessels were wrecked, and several lives lost along the coast. Ample and timely warning was issued in advance of the storm. Storm warnings were also issued on the 11th.—*J. W. Smith, District Forecaster.*

## NEW ORLEANS FORECAST DISTRICT.

The month, as a whole, was mild. The temperature was above normal, except in the panhandle of Texas. Precipitation was excessive over western Texas and eastern Arkansas, and was generally deficient elsewhere.

Snow occurred over Oklahoma, western Texas, and the northern portion of eastern Texas at the close of the second decade; it was generally covered by the forecasts. Frost or freezing temperature warnings were issued for portions of the district on five dates, and frost or freezing temperature occurred in some instances over the territory covered by the forecast, and, in other instances, as a result of sluggish movement of the disturbances, the warnings were not verified over the entire area covered by them.

Cold-wave warnings were issued on the 19th for Arkansas, northwestern Louisiana, and portions of eastern Texas. The warnings were verified in Texas, but, owing to the unusually sluggish movement of a low pressure area over southern Texas, the cold wave did not reach Shreveport, La., and Arkansas points.

No severe weather conditions occurred to any great extent without warnings.—*I. M. Cline, District Forecaster.*

## LOUISVILLE FORECAST DISTRICT.

The weather conditions were largely controlled, up to the 10th, and after the 21st, by moderate high-pressure areas which gave generally fair weather, with moderate temperatures. The first disturbance of the month past over the district the 10-11th, and was attended by rain and thunderstorms, followed closely by much lower temperature. From the 13th to the 21st, inclusive, three general disturbances moved over the central valleys, the first two from the Rocky Mountain section, and the last from the western Gulf. The first of these gave rain or snow over the district, the second heavy rains, and the third generally excessive rains, causing floods in the smaller rivers, resulting in a great amount of damage. Abnormally high temperatures were registered on the 8-9th and on the 20th-21st. There were no unusually low temperatures and only one moderate snowstorm. No cold wave or special warnings were required.—*F. J. Walz, District Forecaster.*

## CHICAGO FORECAST DISTRICT.

The month was uneventful in this forecast district, with the exception of the storms which past over the Lake region during the latter portion of the month. The one of the 16th and 17th approached from the southwest, but did not attain great force until it reached the western Lake region. During the day and night of the 16th the barometer fell rapidly at the storm center, and high winds were general over the Lakes; storm warnings were ordered in advance on the 16th. Storm warnings were ordered on the 21st for a disturbance which approached the Lake region from the western Gulf section, and past across the western upper Lake region, turning thence eastward down the St. Lawrence Valley. This storm was not so severe as the previous one, but justified ordering warnings at all stations. Still another disturbance approached the Lake region from the southwest and had past the lower Lake region by the morning

of the 27th. Warnings were hoisted at Chicago on the evening of the 25th, and were extended over the balance of the upper Lakes on the morning of the 26th. Verifying velocities were reported at several stations. Warnings were again ordered on the evening of the 29th for a disturbance of slighter energy which approached the Lake region from the British Northwest.

There were no snowstorms of consequence in any portion of the district during the month, and the temperature generally remained moderate, but cold-wave warnings were ordered for the Dakotas, Kansas, and Nebraska on the 16th, in advance of the cold weather following the first storm mentioned in the preceding paragraph. These warnings were verified in the northern sections, but the temperature over Kansas did not fall quite as low as was anticipated.—*Frank H. Bigelow, Professor of Meteorology.*

#### DENVER FORECAST DISTRICT.

The month was colder than usual thruout the district, with an excess of precipitation in south-central Colorado and north-central New Mexico. In the extreme southern part of New Mexico the excess was the greatest on record for November. A cold wave visited the eastern slope on the 17th. No unusually low temperatures were experienced in the northern part of the Plains region, but south of the Arkansas-Platte divide there was a continuous fall for several days, zero, or lower, being reached in the extreme southeastern part of New Mexico.—*F. H. Brandenburg, District Forecaster.*

#### SAN FRANCISCO FORECAST DISTRICT.

The month was usually dry, not more than half the normal rainfall being reported; few storms appeared on the northern coast or extended southward. Ordinarily November marks the beginning of the stormy period on the north Pacific coast, but this year the pressure distribution has been unfavorable for the normal storm movement. On the other hand, there has been a tendency for depressions forming over lower California and northwestern Mexico to move slowly northward over the Valley of the Colorado, with little, if any, easterly component of motion. In other words, there have been several cases where the disturbances appeared to be blocked in their eastern progress.

The month began with a disturbance on the Oregon coast which developed into a storm of marked energy. This caused high southeast winds and rain north of Point Conception. The storm was quite severe on the northern coast; warnings were displayed in ample time.

From November 5 to 14 the weather was clear and warm in California, under the influence of a succession of slow-moving high areas. During the latter half of the second decade unsettled weather prevailed, due to the passage of northern lows. During the third decade cold weather, with heavy frosts in the mornings, was reported generally in northern California. In southern California there was a succession of low areas, which apparently made but little progress eastward. High northerly winds resulted in the great Valley of California and along the coast. On November 30 a maximum wind velocity of 63 miles per hour from the northeast occurred at San Francisco. This is the highest wind velocity from the north which has ever been reported in this city.

Frosts have been unusually numerous for the month of November, notwithstanding high winds and dry conditions.—*A. G. McAdie, Professor and District Forecaster.*

#### PORTLAND, OREG., FORECAST DISTRICT.

The first half of November was very stormy, and this district was visited by a succession of gales of unusual severity. Timely warnings were displayed in each case. The only casualty that occurred was the stranding just south of the mouth of the Columbia River of the British bark *Galena* on November 13. No lives were lost when this ship was wrecked, and the cause of the disaster was not so much on account of

high winds as it was from fog and strong currents, whereby the navigating officer lost his reckoning and got into the breakers when he thought he was several miles away from them. A similar casualty occurred on October 25 (not previously reported) to the British bark *Peter Iredale*, which was wrecked on Clatsop spit during thick weather. No lives were lost, but the vessel became a total wreck.

The rains attending the storms of the fore part of the month were unusually heavy, especially in Washington, and all streams in that State between the 9th and 15th overflowed their banks and flooded the lowlands. The damage from floods was enormous, and it was several days before traffic was resumed over the railroads. Three or four lives were lost and large quantities of saw logs were swept away from their booms and never recovered. Many bridges, both railroad and county, were destroyed, and the damage in farming communities to fences, stock, and buildings was very great. In Oregon the rains were not so heavy; the rivers only became bank full, and little damage ensued. The last half of the month was generally fair and cooler with moderate but disagreeable east winds.—*E. A. Beals, District Forecaster.*

#### RIVERS AND FLOODS.

The only great flood of the month occurred in the North Pacific States, and mainly over the watersheds of the smaller streams where no river and flood service is maintained. The details regarding these floods were fully covered in the public press, and a brief mention of them is made in another part of this REVIEW. They were caused by the excessive rains during the first decade of the month, accompanied by high temperatures which rapidly melted the several feet of snow already on the mountain ranges.

The rise in the Columbia River was only moderate, but in the Willamette it was more pronounced, altho flood stages were reached only in the vicinity of Portland, Oreg., where a stage of 16 feet, or one foot above the flood stage, was reached on the 18th.

There were no other floods of consequence except in the Tennessee River. This flood was caused by the heavy snows of the 14th and 15th, the high temperatures of the 15th causing the rapid melting of the snows, together with the heavy rains from the 17th to the 19th, inclusive. At many places along the upper Tennessee River the stages reached exceeded all previous records for the month of November, and considerable damage was done by the rising waters. The following report on the flood over this portion of the Tennessee watershed was prepared by Mr. L. M. Pindell, official in charge of the local office of the Weather Bureau at Chattanooga, Tenn.:

On November 14 and 15 heavy snows prevailed over the entire Tennessee watershed from central Tennessee to Virginia. The snow varied in depth from 4 to 8 inches, and was the heaviest on record for the month of November. The ground was frozen and comparatively dry, and very little of the snow melted on the 14th. On the 15th the temperature began to rise, and the melting snow moistened the ground almost to the point of saturation. Rain began on the 17th, became heavy during the same evening, and continued until the 19th. A report for the 19th from Murphy, N. C., on the headwaters of the Hiwassee River, delayed twenty-four hours in transmission, stated that 8 inches of rain had fallen. McGhee, Tenn., on the Little Tennessee River, reported 4.74 inches, and Rogersville, Tenn., on the Holston River, 3.62 inches during the twenty-four hours ending at 8 a. m. of the 19th. All the precipitation that had fallen was finding its way into the river and tributaries. A careful study of the conditions justified a forecast of 25 feet at Chattanooga, Tenn., by the night of the 20th. At 7 a. m. of the 19th, the Clinch River had risen over 12 feet at Speers Ferry, Va., and was within 4.5 feet of the flood stage; an 18-foot rise was reported at McGhee, on the Little Tennessee, making the river over 2 feet above the flood stage, and a nearly 17-foot rise at Charleston, Tenn., on the Hiwassee, or within 2 feet of the flood stage. The rise at Clinton, Kingston, Tazewell, Knoxville, and Loudon, Tenn., varied from 7 to 8 feet.

Warnings of the sudden rise were promptly issued and given wide distribution, with the result that large quantities of lumber and other